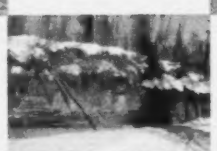
Coal and Mineral Development in Alberta
2016 Year in Review



Alberta Interactive Minerals Map
Metallic and industrial mineral activity
Coal mining and projects
Caribou
Industrial mineral and coal production and royalty

Alberta

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CMD Year in Review-06 (2016)

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The information contained within this report has been collected from publicly available government information, company websites, press releases, and reports filed on Sedar (www.sedar.com). All figures quoted are current as of the time of publication. Please consult the company websites for specific information regarding any projects outlined in this report. Any other references are noted within the document. The authors make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.

Cover photos

Alberta Interactive Minerals Map - Alberta Geological Survey
Sandstone outcrop - Athabasca Minerals Inc.
Ironstone outcrop - Ironstone Resources Ltd.
Creek sampling - Ram River Coal Corp.

Introduction

Alberta's mineral exploration sector marginally rebounded in 2016 due to higher commodity prices following a multi-year downturn. Throughout the year, Alberta benefited from exploration for lithium, diamonds, uranium, coal, and other commodities. Industrial mineral producers mined limestone, dimension stone, salt and silica sand, while Ironstone Resources Ltd. continued to advance its iron-vanadium project in northwest Alberta.

The price of metallurgical coal dramatically surged to over US$300/tonne for the first time since 2011, boosting interest in the Alberta's bituminous metallurgical coal prospects. Metallurgical coal is exported out of the province to steel-making facilities, mainly in Japan and other Asian destinations. Metallurgical coal continued to be mined for export from Teck's Cardinal River Mine south of Hinton, while the Grande Cache Coal mine remained on care and maintenance. Riversdale Resources Ltd. worked to advance its Grassy Mountain metallurgical coal mine development project in the Crowsnest Pass area, while Ram Coal Corporation continued work on its Aries metallurgical coal project near Rocky Mountain House. Westmoreland Coal Company's Coal Valley mine operated throughout 2016, producing bituminous thermal coal for export.

Metallic and industrial minerals

Mineral exploration and development activity in Alberta resumed in 2016 at subdued levels after a historical low in 2015. The exploration sector was energized in 2016 by a sharp increase in lithium carbonate prices and reinvigorated interest in Alberta's lithium potential. Diamond and uranium exploration efforts in northern Alberta continued, albeit at low levels. Work continued on an advanced iron-vanadium project in the Peace River area and industrial mineral mines in the province continued to produce limestone, dimension stone, salt, and silica sand.

The total land area held as Metallic and Industrial Minerals Permits continued to decline, following

Metallic and Industrial Minerals Permits

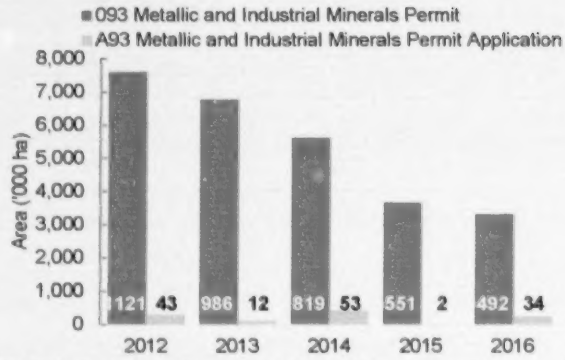


Figure 1. A bar graph with the total area of metallic and industrial minerals permits and permit applications from 2012 through 2016 (the report period is October 1 through September 30). Numbers at the base of the bars indicate the number of individual permits or applications.

Metallic and Industrial Minerals Leases

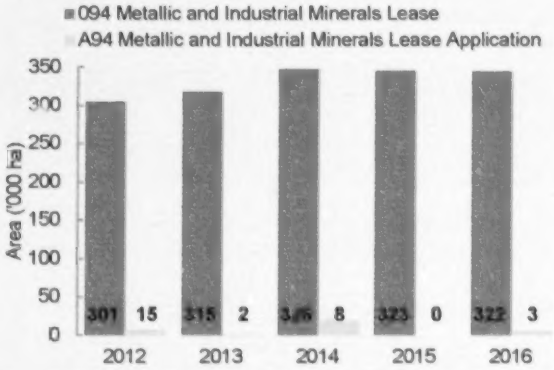


Figure 2. A bar graph with the total area of metallic and industrial minerals leases and lease applications from 2012 through 2016 (the report period is October 1 through September 30). Numbers at the base of the bars indicate the number of individual leases or applications.

a five year trend; however, the decline levelled off from 2015 to 2016 (Figure 1). The total area held as Metallic and Industrial Minerals Leases remained consistent from 2015 to 2016 (Figure 2). The number of Metallic and Industrial Minerals Licences (required for recreational placer gold mining) continued to increase in 2016 (Figure 3). Mineral assessment expenditures filed in 2016 increased from 2015 (some are still pending acceptance by the department), and the number of assessment reports submitted nearly doubled (Figure 4).

2016 metallic and industrial mineral exploration highlights

Iron

Ironstone Resources Ltd. continued to advance its Clear Hills iron-vanadium project, located approximately 200 kilometres north of Grande Prairie in northwest Alberta. The region hosts a near-surface iron-vanadium deposit that extends along the eastern flanks of the Clear Hills (Figures 5 and 6).

In 2012, SRK Consulting (Canada) Inc. prepared a resource estimate for the Clear Hills project outlining an Indicated Resource of 557.7 million tonnes grading 33.3 per cent iron and 0.20 per cent vanadium pentoxide (V_2O_5), and an Inferred Resource of 94.7 million tonnes grading 34.1 per cent iron.

In 2016, Ironstone worked with Hazen Research to conduct additional mineral processing work to optimize grades and recoveries. The results will inform the development of process flow sheets and mine plans to determine if high-strength steel for the domestic market or hot briquetted iron for export will be produced. Ironstone is also working on plans to extract vanadium pentoxide during the production process.

Ironstone is evaluating other resources at the Clear Hills site, including bentonite clay and lithium. Bentonite is used in the building and construction industries as a lightweight concrete substitute. Lithium is in high global demand due to surging lithium-ion battery use.

In September 2016, Ironstone and Grande Prairie Regional College formally signed a Memorandum of Understanding (MOU) to collaborate on skills, trades and apprenticeship training as well as research and innovation projects related to product development initiatives at the Clear Hills' project.

Metallic and Industrial Minerals Licences

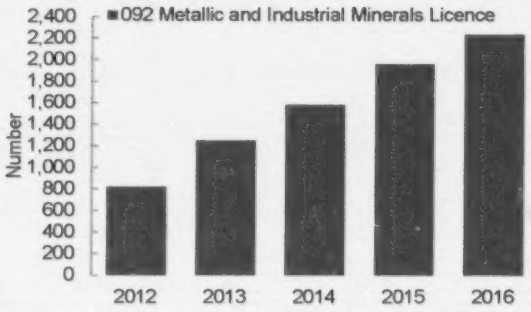
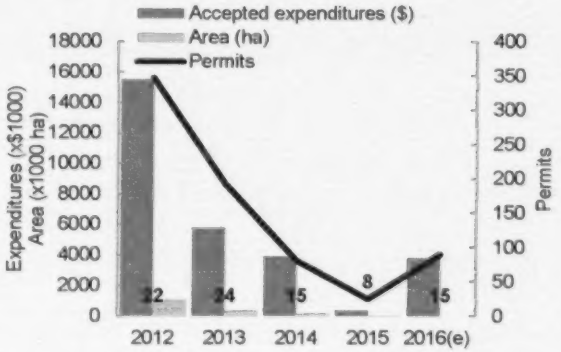


Figure 3. A bar graph with the total number of active metallic and industrial minerals licences from 2012 through 2016 (the report period is October 1 through September 30). Metallic and Industrial Minerals Licences are issued for the right to recover gold through recreational placer mining.

Assessment Report Expenditures



Year	Reports	Permits	Area (ha)	Accepted expenditures ($)	Payment in lieu
2012	22	347	2,400,416	$15,532,731	$0
2013	24	193	1,101,370	$5,746,824	$0
2014	15	81	282,960	$3,905,340	$0
2015	8	25	116,519	$347,853	$0
2016(e)	15	90	378,541	$3,796,210	$0

Figure 4. A graph of mineral assessment report statistics for 2012 through 2016. The number of permits and area are those reported in submitted reports. The accepted expenditures are those accepted by Alberta Energy; the total amount claimed is not reported, but is higher than the accepted expenditure value. Numbers at the base of each bar are the number of reports received. (e) Accepted values for 2016 are preliminary because not all report reviews were completed at the time of publication.

Figure 5. An outcrop of oolitic ironstone along Rambling Creek at Ironstone Resources' Clear Hills project. Photo courtesy of Ironstone Resources Ltd.

Uranium

AREVA Resources Canada Inc. completed a C$600,000 five hole, 2,000 metre wire-line core drilling program from mid-February to late March 2016 on its Maybelle River property located in northeast Alberta (Figure 6). The holes were drilled in an area about four kilometres north of the Dragon Lake uranium occurrence. This is the first active drill program on the property since 2003. The Maybelle River property is 72.2 per cent owned by AREVA (operator) and 27.8 per cent owned by **Cameco Corp.**

Brazil Resources Inc. announced the results of a time domain electromagnetic ground survey on its Rea uranium property in northeast Alberta (Figure 6). The Rea project is owned by Brazil Resources (75 per cent) and AREVA Resources Canada Inc. (25 per cent). The survey covered 4.6 square kilometres and totalled 35.7 line kilometres of data on lines 200 metres apart. The survey identified a single 1.8 kilometre northerly trending conductor that is situated two kilometres west of AREVA's Maybelle River property. In December 2016, Brazil Resources changed its name to GoldMining Inc.

Diamonds: Buffalo Head Hills Kimberlite Field

The Buffalo Head Hills kimberlite field in north-central Alberta (Figure 6) covers approximately 2,500 square kilometres and is the third largest known district of diamond-bearing kimberlites in Canada. A total of 41 kimberlites have been identified in the Buffalo Head Hills field, of which 28 contain diamonds.

On March 29, 2016, **Canterra Minerals Corp.** provided an update on the Buffalo Head Hills Joint Venture (**Canterra**, **Shore Gold Inc.** and **Encana Corp.**). The partners hold 22 Metallic and Industrial Minerals Leases covering individual kimberlites in the Buffalo Head Hills kimberlite field. Canterra conducted a data review in 2016 for the Buffalo Head Hills Joint Venture and announced that untested geophysical anomalies north and west of the main project area had a high probability of being diamondiferous kimberlite. The company acquired four new Metallic and Industrial Mineral Permits covering the two areas of interest.

Canterra also announced the results of a breakage study for diamonds, which were previously recovered from the K6 kimberlite in 2008. At that time, a total of 231.89 tonnes of kimberlite were extracted from surface pits. A total of 16.28 carats were recovered with a reported sample grade of 7.02 carats per hundred tonnes. Canterra's breakage study determined that a 1.77 carat diamond was broken during processing in 2008. Prior to breakage, the diamond was a colorless single tetrahexahedroid crystal with very few inclusions. Canterra noted that this is the largest diamond recovered from the Buffalo Head Hills project to date. In addition to the 1.77 carat diamond, three diamonds exceeding one carat and of similar shape, color and clarity were also recovered from that sample.

Grizzly Discoveries Inc. completed 76 line-kilometers of ground magnetic surveys at eight grids during June and July 2016. The surveys covered nine coincident LIDAR-magnetic targets in the Buffalo Head Hills area. The surveys yielded two priority kimberlite targets along with three other lower priority targets that warrant follow-up exploration, including additional electromagnetic or gravity surveys prior to evaluation by drill testing.

Diamonds: Athabasca Basin Exploration

On April 12, 2016, **CanAlaska Uranium Ltd**. announced the acquisition of eight Metallic and Industrial Mineral Permits covering 99,840 hectares south of Lake Athabasca and abutting the Saskatchewan border (Figure 6). The permits in Alberta are located north of a group of kimberlite indicator minerals identified in the Fort McKay and Fort McMurray area in the 1990s by the Alberta Geological Survey. Although other companies have explored for kimberlite in the area, the source of the kimberlite indicator minerals has yet to be discovered.

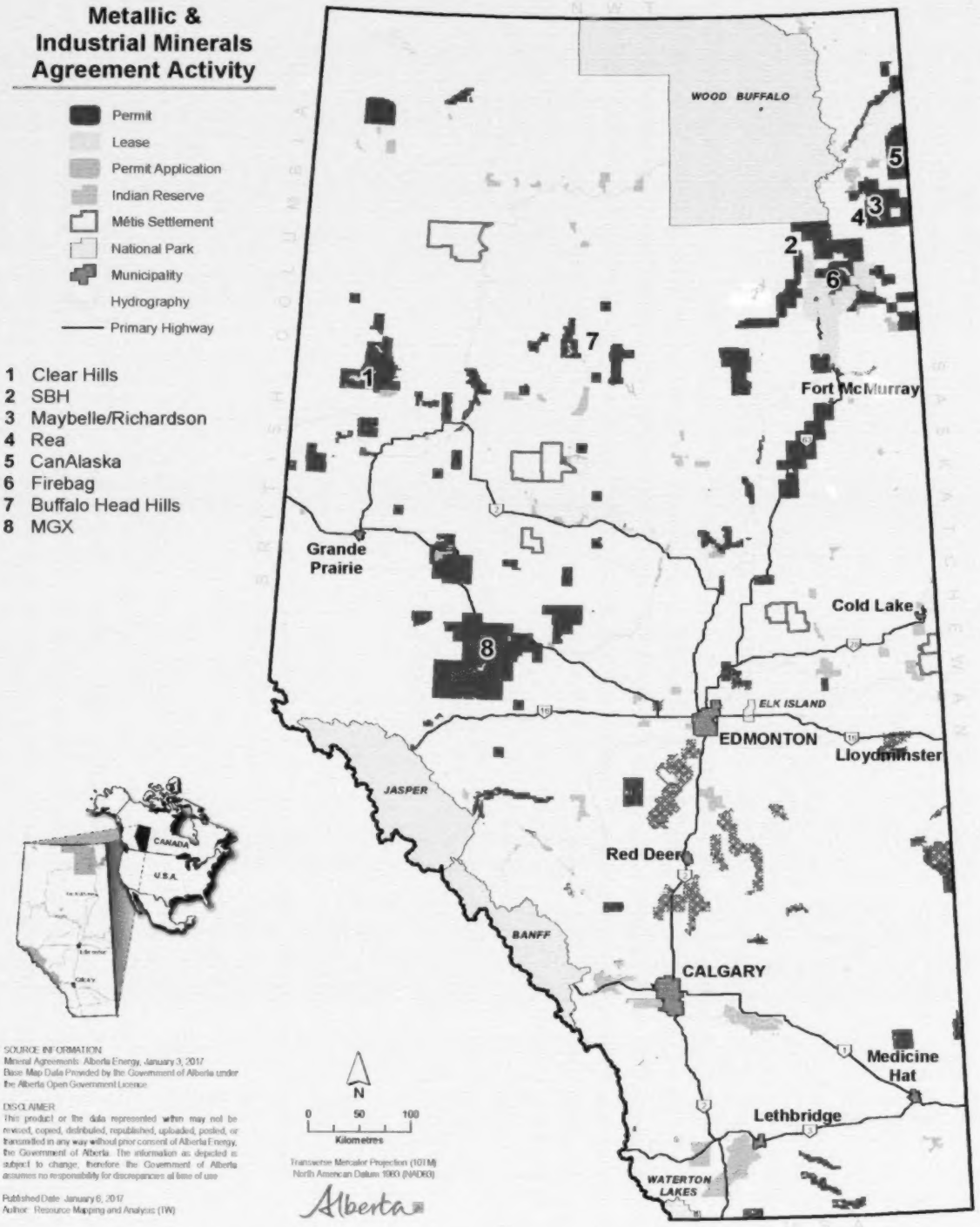


Figure 6. A map of Alberta showing metallic and industrial mineral tenure activity as of January 2016. An interactive, real-time version of this map is available at www.energy.alberta.ca/OurBusiness/1072.asp.

CanAlaska completed a 4,000 line-kilometre low level, detailed airborne survey over the project area and detected a series of 50 magnetic anomalies. The company noted a number of coincident electromagnetic anomalies while compiling the new survey results with previous regional and local surveys.

Lithium

Several companies announced lithium exploration projects in Alberta in 2016. In Alberta, elevated amounts of lithium are found in waste brine co-extracted with oil and gas from Devonian reservoirs. These waters are processed for petroleum products before being reinjected back into the ground. Companies are evaluating whether compounds such as lithium carbonate, and potentially other commodities, can be extracted from the wastewater before re-injection.

By the end of 2016, **MGX Minerals Inc.** held 486,800 hectares of Metallic and Industrial Mineral Permits for lithium exploration (Figure 6) and entered into an agreement to acquire PurLucid Treatment Solutions Inc.. PurLucid has technology that separates oil from oilfield wastewater brine. MGX is working with oil and gas partners to construct a 12 cubic metre per day test plant and will potentially use the results to scale up to a larger modular lithium extraction plant. The concept is to precipitate lithium carbonate directly out of the wastewater in one day, as opposed to waiting over a year using the evaporation method currently employed by Nevada and South America lithium mines.

Empire Rock Minerals Inc. entered into various agreements to acquire a 70 per cent interest in the Fox Creek lithium project and 100 per cent interest in the Well Permit area, also in Fox Creek.

LithAlta Ltd. was formed to evaluate the lithium potential of Ironstone Resources Ltd.'s Clear Hills project in northwest Alberta. The company is evaluating the lithium potential of enriched brines located on the southern extent of the company's Clear Hills iron-vanadium project located in northwest Alberta.

In 2016, **Scientific Metals Corp.**, **Victory Ventures Inc.** and **Revere Development Corp.** announced lithium projects in Alberta. **Softrock Minerals Ltd.** holds Metallic and Industrial Minerals Permits in north and central Alberta with lithium and potash potential.

Polymetallic Shale

DNI Metals Inc. holds Metallic and Industrial Minerals Permits covering the SBH property approximately 120 kilometres north of Fort McMurray (Figure 6). The permits cover three near-surface Cretaceous black shale formations which are locally enriched in base metals, uranium, rare earth elements, and specialty metals. In 2013 and 2014 DNI released Preliminary Economic Assessments (PEA) for the Buckton deposit that contemplate production of uranium, rare earth oxides, zinc, nickel, copper, cobalt, yttrium and scandium oxide.

On December 23, 2016, DNI announced it had completed a Letter of Intent with **BullRun Capital Inc.**, where BullRun plans to purchase the SBH property, including the Buckton deposit. The definitive agreement is to be completed before January 15, 2017.

Silica sand

Athabasca Minerals Inc. continued to advance its Firebag silica sand project located 95 kilometres north of Fort McMurray (Figure 6). The Firebag operation has potential to produce high quality silica sand (frac sand) for use in the hydraulic fracturing of oil and gas bearing formations. A Preliminary Economic Assessment released by the company in 2015 contemplated production of 897,072 tonnes of frac sand per year for 25 years. The Firebag property is now regulated by a Surface Material Lease in accordance with the *Public Lands Act*, as opposed to a Metallic and Industrial Minerals Lease. Athabasca is working on permitting an access road and stockpile site for the Firebag project site. The company is also working on

Figure 7. Outcrop at Athabasca Minerals' Richardson project. Photo is courtesy of Athabasca Minerals Inc.

permitting for a potential transloading facility in the Lynton region, located 100 kilometres south of the Firebag Project.

In 2015, Athabasca announced that it had entered into a purchase agreement with **Coal Valley Resources Inc.**, a subsidiary of Westmoreland Coal Company, to purchase a private rail transloading facility located at the Obed Mountain coal mine site (inactive). Athabasca transferred its rights of first refusal for the Obed facility to **Wayfinder Corp.** In June 2016, Athabasca announced the closing of the sale of Athabasca's rights, title, and interests surrounding three leases bordering the Obed Transloading Facility to Wayfinder Corp. for a purchase price of C$800,000. As part of the closing of the sale, Athabasca maintains the right to construct a drying facility and work with Wayfinder to utilize rail infrastructure for the sale of certain aggregates. In addition, Athabasca will maintain the ability to distribute future Firebag project frac sand via the Obed facility.

In 2016 Athabasca received approval to explore for silica sand along the southeastern slopes of the Birch Mountain area in northeast Alberta.

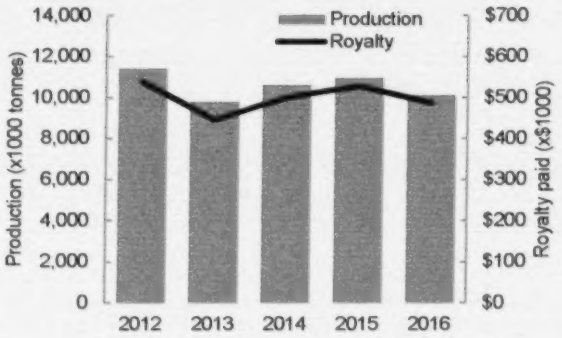
Dolostone and Granite

Athabasca Minerals Inc. completed a geophysical survey in Fall 2016 over the Richardson aggregate project located in northeast Alberta approximately 130 kilometres north of Fort McMurray (Figure 6). The purpose of the survey is to identify potential drill targets. The company is assessing the Richardson project for its crushed rock aggregate potential suitable for such applications as building construction and road stone. A winter road extending from the hamlet of Fort Chipewyan traverses through the central portion of the Richardson project and provides seasonal access with transport load capacity. Athabasca is also assessing the basement granite on the property (Figure 7). A resource estimate released in 2015 stated an initial Inferred Resource of 683 million tonnes of aggregate, mainly dolostone and an initial Inferred Resource of 165 million tonnes of underlying granite.

Heavy minerals

In 2016 **Titanium Corporation Inc.** was granted two additional patents covering key aspects of its technology to recover hydrocarbons and minerals from oil sands froth treatment tailings. Titanium

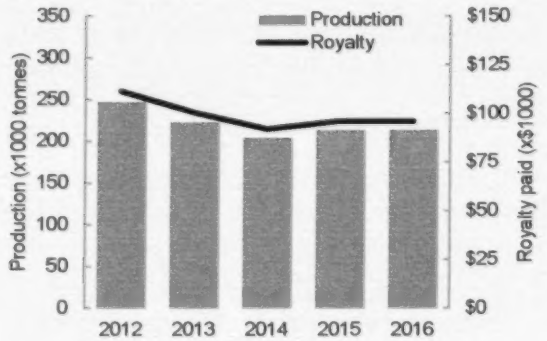
Quarriable Mineral Production



Year	Production (t)	Royalty
2012	11,399,983	$537,621
2013	9,794,655	$445,496
2014	10,583,127	$500,671
2015	10,934,343	$527,966
2016	10,121,480	$486,514

Figure 8. The total quarriable mineral production and royalty collected for the last five years, including 2016. The report period is from October 1 to September 30. Quarriable minerals include dolomitic siltsone, limestone, sandstone, shale, and silica sand.

Salt Production



Year	Production (t)	Royalty
2012	246,968	$111,136
2013	222,631	$100,184
2014	203,659	$91,647
2015	213,004	$95,852
2016	212,826	$95,772

Figure 9. The total salt production and royalty collected for the last five years, including 2016. The report period is from October 1 to September 30.

also engaged an independent engineering firm to conduct a feasibility cost savings study for the company's technology. The results of the study indicate capital cost reductions in the range of 10 per cent. Titanium recently revised its project proposals to oil sands operators.

2016 industrial mineral quarry activities

Production and royalty. The production of quarriable minerals (including limestone, dolomitic siltstone, sandstone, and silica sand) was down from 2015, while salt production remained the same (Figures 8 and 9). Limestone continues to be the most significant quarriable commodity produced in Alberta during the last five years. Salt production, from the Devonian Elk Point Group, is from in situ leach and brine extraction operations (rather than traditional mining methods).

Table 1 lists all operating industrial mineral quarries in Alberta.

Industrial Mineral Quarries

Mine/Quarry	Commodity	Location	Operator
Bay Tree	Shale	Grande Prairie	WK Ventures Ltd.
Calling Lake*	Salt	North of Athabasca	Calcium Inc.
Clearwater	Limestone	Rocky Mountain House	Burnco Rock Products Ltd.
Cougar Ridge	Limestone	Rocky Mountain House	Prairie Creek Quarries Ltd.
Exshaw	Limestone	Exshaw	Lafarge Canada Ltd.
Fish Creek	Limestone	Nordegg	Graymont Western Canada Inc.
Fort McMurray West	Limestone	Fort McMurray	Suncor Energy Inc.
Gap	Limestone	Exshaw	Graymont Western Canada Inc.
McLeod	Limestone	Cadomin	Lehigh Hanson Materials Ltd.
Mitsue*	Salt	Slave Lake	Tiger Calcium Services Inc.
Muskeg	Limestone	North of Fort McMurray	Hammerstone Corporation
Peace River Silica	Silica Sand	Peace River	Contractors Leasing Corp.
Riverview*	Salt	Riverview	The Canadian Salt Company Ltd.
Rundle Stone	Dolomitic Siltstone	Canmore	Kamenka Quarries Ltd.
Seebe	Shale	Kananaskis	Lafarge Canada Ltd.
Sprayfalls	Sandstone	Exshaw	Thunderstone Quarries Ltd.
Steepbank	Limestone	North of Fort McMurray	Hammerstone Corporation
Summit Lake	Limestone	Coleman	Graymont Western Canada Inc.
Sunnynook*	Salt	Drumheller	Jarodon Resources Ltd.
Vicory	Sandstone	Coleman	Pat Dwyer Construction Inc.
Yamnuska	Sandstone	Kananaskis	Lafarge Canada Ltd.

Table 1. A table of the active industrial mineral quarries in Alberta; there are no metallic mines. *Salt is produced through in situ leaching or from subsurface brines.

Coal

During 2016 the Government of Alberta announced further details on the Climate Leadership Plan objective of phasing out pollution from coal-fired electricity generating units. The government has agreed to provide transition payments to the companies which were originally slated to operate their coal-fired units beyond 2030. The plan will impact subbituminous coal mining operations in Alberta that provide the coal for the generating units.

The total area and number of coal leases in the province decreased further in 2016 to the lowest level in ten years (Figure 10). See Figure 12 for a map of Alberta's coal fields, coal ranks, mines, and projects.

2016 coal exploration and advanced project highlights

Riversdale Resources Ltd., through its wholly owned subsidiary, **Benga Mining**, continued to work on advancing the Grassy Mountain bituminous metallurgical coal project (Figure 11) in the Crowsnest Pass area of southwest Alberta, approximately seven kilometres north of Blairmore (Figure 12). The company has submitted applications to the Alberta Energy Regulator for approval of the Grassy Mountain coal mine. The applications are for a surface metallurgical coal mine and approvals to construct and operate a new coal processing plant and rail loading facility. The proposed surface mine would produce up to four million tonnes of bituminous metallurgical coal for export per year for 24 years, starting in 2021. In addition to the permit applications, Riversdale has submitted an environmental impact assessment (EIA) report which was referred to an independent review panel by the Canadian Environmental Assessment Agency. Grassy Mountain is a historical coal producer that had comprehensive exploration work, bulk sampling, and feasibility analysis during the 1970s and early 1980s.

Coal Leases

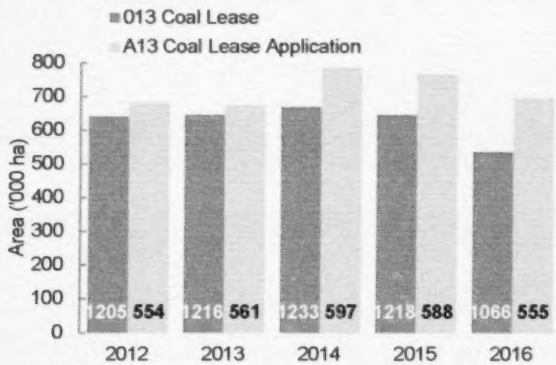


Figure 10. A bar graph with the total area of coal leases and lease applications from 2012 through 2016 (the report period is October 1 through September 30). Numbers at the base of the bars indicate the number of individual leases or applications.

Figure 11. A photo of historical mining activity at Riversdale Resources' Grassy Mountain property showing exposed coal seams. Photo is courtesy of Riversdale Resources.

Work continued in 2016 on the **Altitude Resources Ltd.** and **Japan Oil, Gas and Metals National Corporation** (JOGMEC) joint venture Palisades metallurgical coal property located north of Highway 16 and 35 kilometres northwest of Hinton, Alberta (Figure 12). JOGMEC has a three year commitment with Altitude to spend C$4.8 million to complete fieldwork, drilling, and a mining study; this will earn JOGMEC a 51 per cent interest in the Palisades property.

In 2015, Altitude completed geological mapping, rotary drilling of 22 holes totaling 2,735 metres and three holes of diamond drilling totaling 62 metres. A fourth hole did not intersect coal. The company released an In-Place Resource estimate of surface-mineable bituminous and mid-volatile coal for the Coal Hill/Central Palisades and South Palisades areas; Measured Resource of 9,004,301 tonnes, Indicated Resource of 6,801,571 tonnes and an Inferred Resource of 7,606,377 tonnes.

On February 25, 2016, Altitude announced that JOGMEC agreed to proceed to complete the second milestone of the agreement, which called for a further contribution of C$1.5 million towards exploration on the Palisades project.

A total of 3,141 metres in 26 rotary and eight core holes were completed on the Palisades property in 2016, in addition to trenching. The budget for

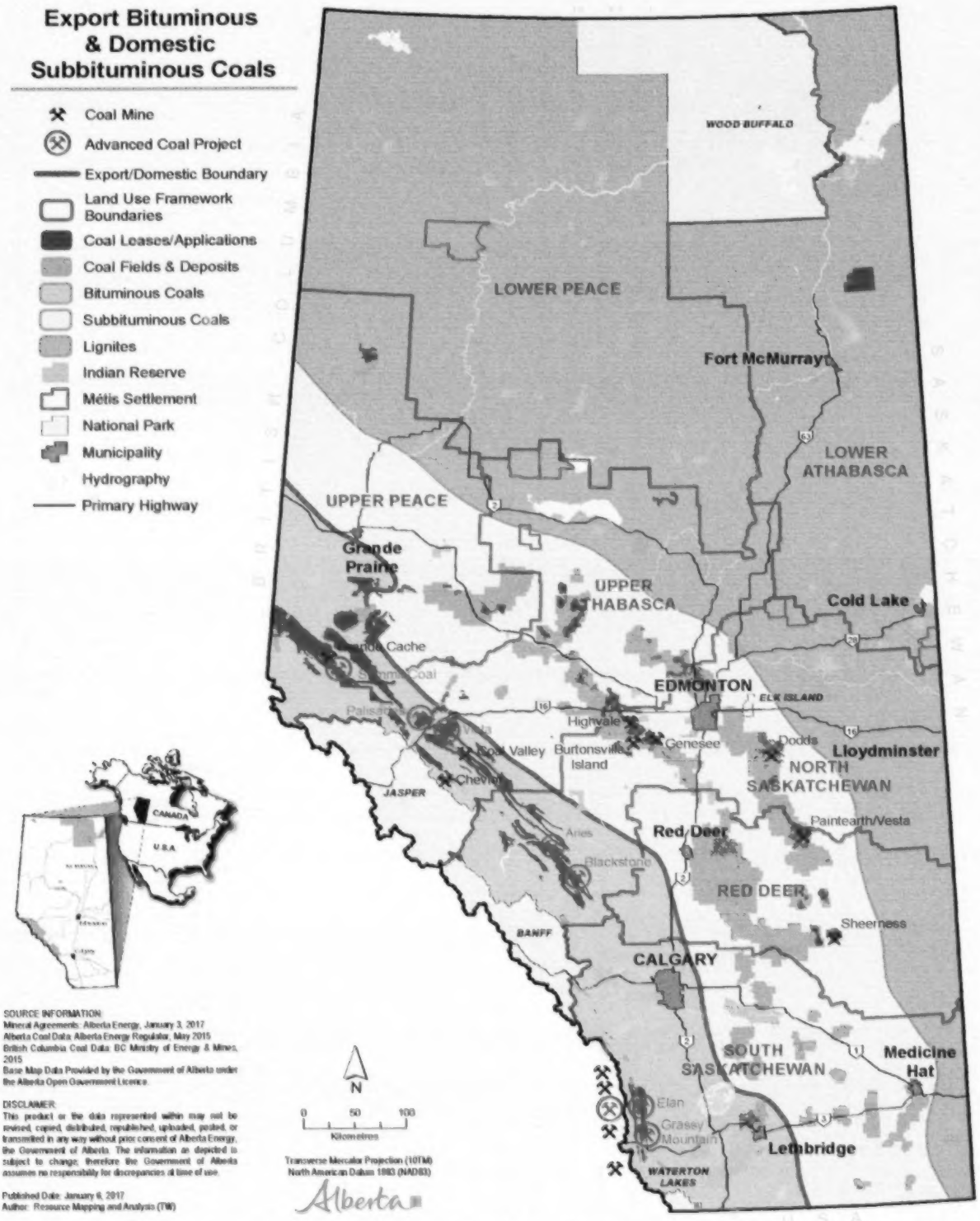


Figure 12. A map of Alberta showing coal tenure activity (dark brown), and coal mines and projects, as of January 2016. Coal fields (light brown) and approximate coal rank distribution (coloured bands) are also shown. An interactive, real-time version of the coal tenure on this map is available at www.energy.alberta.ca/OurBusiness/1072.asp.

the project was C$1.55 million. Results from the 2016 program will be used to support an updated resource estimate. JOGMEC now holds 31.675 per cent of the Palisades joint venture project.

In September 2016, **Ram River Coal Corp.** initiated a Prefeasibility Study on its Aries bituminous metallurgical coal project located 50 kilometres west southwest of Rocky Mountain House (Figure 12). The study and an updated resource estimate is projected to be completed in early 2017. The Prefeasibility Study focuses on development of the North Block and evaluates a 6 million tonne per year mining operation over 30 years. During 2016 the company continued to work on its environmental baseline studies (Figure 13) and stakeholder engagement program.

In 2014, the company disclosed a resource estimate for the Ram River coal project of 497 million tonnes of Measured, Indicated and Inferred Resources. Additional coal resources are found on Ram River's adjacent Scurry Ram property.

2016 coal mine activities

Production and Royalty. Bituminous coal production in Alberta remained at the same level in 2016 as 2015; however, the royalty collected on coal production was lower (Figure 14). Subbituminous coal production was down slightly from 2015 (Figure 15). A decrease in royalty collected on subbituminous coal in 2016 was due to decreased production as well as a decrease in the Crown-owned portion of production to 68% as compared to 2015.

Table 2 lists all operating coal mines in Alberta.

Grande Cache Coal Mine

Mining activities and operation of the coal processing plant at the No. 8 surface coal mine at the Grande Cache coal property were suspended during 2016. **Grande Cache Coal Corporation** continued regulatory monitoring and inspection activities during the suspension period. In November 2016 the company announced that it had submitted an application to the Alberta Energy Regulator to lift the suspension of the No. 8 Mine and the coal processing plant for approval to resume operations in early 2017. The company also submitted the No. 8 Mine Completion application to the Alberta Energy Regulator, which would allow for an additional six years of mining beyond the 2.5 years already licensed.

Figure 13. A photo of workers doing environmental monitoring data collection on Ram Coal's Aries metallurgical coal property. Photo is courtesy of Ram River Coal Corp.

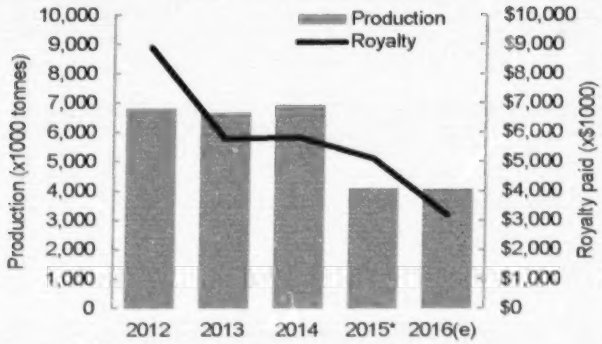
Grande Cache Coal suspended its underground operations at the No. 12 South B2 mine in December 2015. The company is monitoring the entry location for the mine and announced in November 2016 that they intend to resume mining the No. 12 South B2 coal seams. Also in December 2015, the company submitted regulatory permit applications to the Alberta Energy Regulator for the next underground mine, the No. 12 South A. The applications are undergoing review.

Alberta Energy Updates

Alberta Energy, with support from the Alberta Geological Survey, hosted a tradeshow booth at the **Mineral Exploration Roundup** event in Vancouver from January 25-28, 2016. One of Canada's largest mining conventions and trade shows, Roundup provides an opportunity to meet a wide cross-section of companies working in the mineral exploration and development sector in western Canada. Alberta Energy's booth highlighted Alberta's metallurgical coal and mineral potential.

Alberta Energy, in cooperation with other Canadian provinces and territories and the Embassy of Canada to Japan, participated in a **Tokyo Mining Investment Seminar** on September 29, 2016. The seminar, held at the Canadian Embassy in Tokyo, provided an opportunity for Canadian mining companies to meet Japanese companies interested in investing in mining projects or entering into off-take agreements. A broad range of contacts from major Japanese trading houses, mining companies, and smelters attended the event during which speakers highlighted their individual mining projects. Alberta Energy focused on investment opportunities in Alberta's metallurgical coal and minerals sectors.

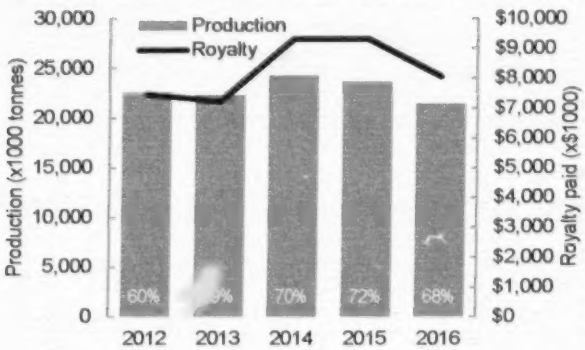
Bituminous Coal Production



Year	Production (t)	Royalty
2012	6,805,148	$8,892,626
2013	6,653,820	$5,775,640
2014	6,915,435	$5,826,830
2015*	4,066,285	$5,107,884
2016(e)	4,060,304	$3,174,305

Figure 14. The total bituminous coal production and royalty collected for the last five years, including 2016. The report period is from October 1 to September 30. *2015 royalty is different than reported in the 2015 edition because of year end reconciliation in April 2016. (e) 2016 royalty and production is an estimate until final reconciliation in April 2017.

Subbituminous Coal Production



Year	Production (t)	Crown %	Royalty
2012	22,483,777	60%	$7,463,258
2013	22,288,559	59%	$7,209,349
2014	24,230,326	70%	$9,314,753
2015	23,613,875	72%	$9,324,471
2016	21,422,954	68%	$8,061,524

Figure 15. The total subbituminous coal production and royalty collected for the last five years, including 2016. The percentages are the portion of the production from Crown coal rights. Alberta Energy only collects royalty on coal production from Crown-owned coal rights. The report period is from October 1 to September 30.

Energy and Mines Ministers' Conference

Alberta Energy participated in the Energy and Mines Ministers Conference (EMMC), held August 21–23, 2016, in Winnipeg, Manitoba. The EMMC is an annual gathering of federal, provincial and territorial ministers responsible for energy and mining portfolios.

The mines session at the conference included a round table that discussed the importance of Canada's junior exploration and mining sector in identifying and developing the next generation of economic mineral deposits. Ministers committed to seeking out opportunities for collaboration to enhance mineral geoscience programs across jurisdictions and to expand the availability of public geoscience data to help facilitate grassroots exploration by the junior mining sector.

Ministers also recognized the need to build on Canada's reputation as a global leader in environmental performance and worker health safety standards. Ministers committed to continue identifying new and innovative methods for managing environmental liability and to develop a consistent and transparent methodology for calculating mine reclamation security, including the total amount of liability that exists.

During the EMMC, Mines Ministers approved three deliverables:

Mining Sector Performance Report. This report provides a snapshot of the Canadian mineral industry's economic, social, and environmental performance from 2006–2015. The aim of the report is to provide Canadians with an understanding of the industry's performance based on credible and reliable data. The report looks at 25 indicators that were developed in consultation with provincial and territorial governments, industry, academia, and Indigenous organizations. The report also highlights the mineral industry's significant contribution to Canada's economic growth and prosperity. The Mining Sector Performance Report is produced every three years.

Public Confidence Along the Mineral Development Cycle. This infographic identifies opportunities to build public confidence throughout the life cycle of a project.

Compendium of Case Studies on Building Public Confidence in the Mineral and Energy Resource Sectors. This compendium documents

Coal Mines

Mine	Coal rank	Location	Owner/Operator	Main use
Cheviot (Cardinal River)	Bituminous	Hinton	Teck Coal Ltd.	Export: metallurgical
Coal Valley	Bituminous	Hinton	Westmoreland Coal Co.	Export: thermal
Dodds	Subbituminous	Ryley	Dodd's Coal Mining Company Ltd.	Small-scale sales
Genesee	Subbituminous	Warburg	Capital Power LP / Westmoreland Coal Co.	Electricity: Genesee generating stations
Grande Cache*	Bituminous	Grande Cache	Grande Cache Coal Corp.	Export: metallurgical
Highvale	Subbituminous	Wabamun	Transalta Corp / SunHills Mining LP	Electricity: Keephills and Sundance generating stations
Paintearth/Vesta	Subbituminous	Forestburg	Westmoreland Coal Co.	Electricity: Battle River generating stations
Sheerness	Subbituminous	Hanna	Westmoreland Coal Co.	Electricity: Sheerness generating stations

Table 2. A table of the active coal mines in Alberta. *As of the end of 2016 the Grande Cache mine is suspended. Applications to restart operations are under review by the Alberta Energy Regulator.

positive approaches to building public confidence in Canada's resource sectors that have been implemented by governments, regulatory authorities, and industry in collaboration with communities across Canada.

These publications can be viewed on Natural Resources Canada's website: *www.nrcan.gc.ca/publications/11102*.

Alberta Geological Survey

The Alberta Geological Survey (AGS) provides information and advice about the geology of Alberta to the Government of Alberta, Alberta Energy Regulator (AER), industry, and the public. The AGS is the provincial geological survey of Alberta, and as such operates by the guiding principles of the Canada Intergovernmental Geoscience Accord, which identifies the provincial survey as being the principal steward, resident authority, and principal investigator for public geoscience. The AGS resides within the AER and is responsible for the systematic description of the geology and resources within the province, as well as providing geoscience information to help inform regulatory decision making relating to resource development, land-use, environmental protection, public health, and safety issues.

The AGS delivers geoscience in several key areas: surficial mapping, bedrock mapping, geological modelling, resource evaluation (hydrocarbons and minerals), groundwater, and geological hazards. The AGS is also responsible for maintaining the Alberta Table of Formations (*ags.aer.ca/table-of-formation*) and providing outreach to a range of stakeholders, including professional colleagues and academics, school children, and the general public.

The AGS creates and disseminates geoscience information through reports, maps, and digital data sets, as well as posters and presentations. Many AGS products are built within a publicly accessible, interactive GIS environment, which includes the development of 3D geological models that enable the visualization of surface and subsurface features and will allow users to incorporate their information within the models.

The AGS website (*www.ags.aer.ca*) delivers a wide range of information on the geology of Alberta, including over 2,500 reports, 400 maps, and 1,300 datasets (digital data, shapefiles, and

digital imagery). Current projects and activities are also highlighted, along with additional geoscience information about Alberta.

3D Geological Framework of Alberta

Current activities at the AGS include the development of a three dimensional (3D) provincial model of Alberta's subsurface. The 3D Geological Framework of Alberta covers approximately 660,000 square kilometres and is composed of multiple provincial-scale units from the modern land surface to the Precambrian basement. The 3D framework acts as a repository for subsurface data and forms the geological foundation for much of the work at the AGS.

In 2016, AGS staff modelled select coal zones in the Upper Cretaceous and Paleogene intervals. These stand alone digital products will be integrated into the 3D Geological Framework.

Visit *ags.aer.ca/activities/3d-geological-framework* for more information about the geological framework and other 3D modelling efforts at the AGS.

Alberta Interactive Minerals Map

The AGS provides web-based interactive maps which let the public visualize geological and mineral resource data within the province. The Alberta Interactive Minerals Map (AIMM) was released in 2015 as a joint project between the AGS (Figure 16) and Alberta Energy to provide the Government of Alberta, the general public, and industry with an interactive application for viewing and querying mineral resources data (Figure 17). These data are also accessible through an open data portal, which directs users to the AGS Open Data Catalogue

Figure 16 . Geologists Gloria Lopez and Noah Nahachewsky working on the Alberta Interactive Minerals Map at the Alberta Geological Survey. Photo is courtesy of the AGS.

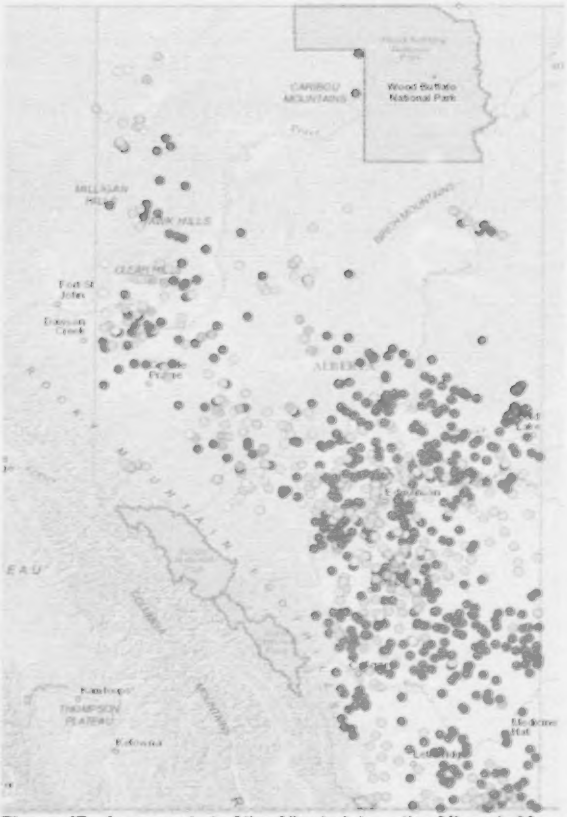


Figure 17 . A screenshot of the Alberta Interactive Minerals Map (accessed from http://ags.aer.ca/data-maps-models/interactive-maps). This view shows concentrations of lithium sampled from oilfield brines.

and provides free access to the public to all data displayed in AIMM.

During 2016, AIMM was updated with the location of active quarries, additional metallic and industrial mineral occurrences identified in AGS reports and mineral assessment reports, as well as mineral resource estimate data from publicly available industry technical reports. Recently published AGS maps have also been added to improve the accuracy of geological base layers in AIMM. The AIMM web application is regularly updated as AGS staff continues to migrate data holdings into this portal. AIMM was viewed over 11,500 times in 2016. Total views of AIMM since its official release on June 16, 2015 total 17,750 (as of December 22, 2016). Viewing of lithium values on AIMM was popular in 2016, accounting for over 7,200 views. Lithium values as presented on AIMM are shown in Figure 17. To explore the AIMM site, please visit the interactive geology map page on the AGS website: *ags.aer.ca/data-maps-models/interactive-maps.*

AGS Open Data Catalogue

The AGS Open Data Catalogue features a subset of GIS data published by the AGS. Data can be downloaded in spreadsheet, shapefile, or KML format. Each dataset is accompanied by a full metadata record so that users understand the original intent of the data and to help them assess its usefulness for their purposes. The Open Data Catalogue is available at *geology.ags-aer.opendata.arcgis.com*.

Mineral Core Research Facility

The Mineral Core Research Facility (MCRF) contains more than 60,500 metres of mineral core, 12,500 metres of coal core, and 17,000 rock samples from various mineral exploration projects in Alberta. In 2016, the MCRF regularly received visitors from exploration companies and academia. Core and rock samples are stored at the MCRF in Edmonton or at the Core Research Centre in Calgary

Detailed information on core holdings can now be found on the Alberta Interactive Minerals Map.

The MCRF is located in southeast Edmonton. For access to the facility, please contact the MCRF at 780-466-1779.

Selected new publications

Alberta Geological Survey

All reports, maps and digital datasets are available for free from the AGS website: *www.ags.gov.ab.ca*. Selected releases in 2016 are provided below:

Bedrock Topography of Alberta. MacCormack, K.E. Lyster, S., and Atkinson, N., AER/AGS Digital Data 2016-0039, 2016.

Diamond Potential in Alberta: Distribution of Kimberlite and Kimberlite Indicator Mineral Clusters. Banas, A. Eccles, D.R, and Dufresne, M.B., AER/AGS Special Report 103, 2016.

Limestone and Dolomite Prospects for Industrial Use in the Alberta Foothills and Front Ranges. Krueger, K., Kluczny, P., and Dahrouge, J.R., AER/AGS Special Report 102, 2016.

Evidence for Early Pleistocene Glaciation from Borecore Stratigraphy in North-Central Alberta. Andriashek, L.D. and Barendregt, R.W., AER/AGS Report 92, 2016

Field Evidence of Nested Groundwater Flow Along the Little Smoky River, West-Central Alberta. Smerdon, B.D., Atkinson, L.A., Hartman, G.M.D., Playter, T.L., and Andriashek, L.D., AER/AGS Open File Report 2016-02, 2016.

Inorganic Geochemistry of Alberta Geological Units for Shale- and Siltstone-Hosted Hydrocarbon Evaluation. Rokosh, C.D., Crocq, C.S., Pawlowicz, J.G., and Brazzoni, T., AER/AGS Digital Data 2016-0001, 2016.

Mercury Porosimetry Data of Alberta Geological Units for Shale- and Siltstone-Hosted Hydrocarbon Evaluation. Rokosh, C.D., Crocq, C.S., Pawlowicz, J.G., and Brazzoni, T. AER/AGS Digital Data 2016-0009, 2016.

Petrographic Analysis of 21 Shale and Siltstone Outcrop Samples from Alberta. Rokosh, C.D., Anderson, S.D.A., and Pawlowicz, J.G., AER/AGS Special Report 100, 2016.

Caribou range planning

Under the federal government's Woodland Caribou Recovery Strategy, all provinces and territories must develop plans for each caribou range (Figure 18) that outline how activities will be managed over time and space to stabilize caribou herd survival and to achieve a target of 65% undisturbed caribou habitat. The Woodland Caribou Recovery Strategy is enabled under the federal *Species at Risk Act*.

Alberta Environment and Parks is leading the development of caribou range plans for each of Alberta's 15 provincially managed caribou populations as required by the federal government. Alberta Energy and Agriculture and Forestry are supporting Alberta Environment and Parks in range planning efforts.

Mediator's report

In December 2015, a mediator was retained by the Government of Alberta to engage stakeholders in a discussion to develop shared understanding and assess areas of agreement on an approach to caribou habitat and population management within the Little Smoky and A La Peche caribou ranges.

The mediator's role was to share information developed by Government with identified stakeholders, characterize stakeholder perspectives, and advise Government on a path forward, considerate of caribou recovery,

stakeholder impacts, and the federal caribou recovery strategies.

The report was submitted to government in late February 2016 and provided recommendations to address many key issues. The mediator's report and a draft range plan for the Little Smoky and A La Peche caribou ranges were released on June 8, 2016. The Government of Alberta announced its intention to move forward with most of the mediator's recommendations.

Mineral sales restriction and tenure extensions

In April 2013, a restriction on mineral tenure sales was placed in the Little Smoky and A La Peche caribou ranges to support and maintain flexibility for range planning. An internal deferral was put into place for the remaining ranges in June 2015. To support the recommendations of the mediator's report, a mineral tenure sales restriction was placed in all caribou ranges in September 2016, replacing the internal deferral process.

The restriction provides government and industry time to align management approaches across all caribou ranges, providing consistency and certainty to energy operators in caribou ranges pending the completion of the range plans.

Alberta Energy intends to resume mineral sales in caribou ranges when range plans are completed, so long as this aligns with the specific range plan details.

As of November 4, 2016 the Government of Alberta is prepared to offer extensions to Petroleum and Natural Gas Agreements, Metallic and Industrial Mineral Permits, and Oil Sands Agreements which fall in whole or in part within a caribou range (For further details, please see Alberta Energy Information Letter 2016-34; *www.energy.alberta.ca/minerals/711.asp*).

Caribou range planning activities

Caribou range planning is anticipated to be complete in late 2017. Existing tenure holders can continue to develop their subsurface mineral rights, subject to current policy and regulatory requirements.

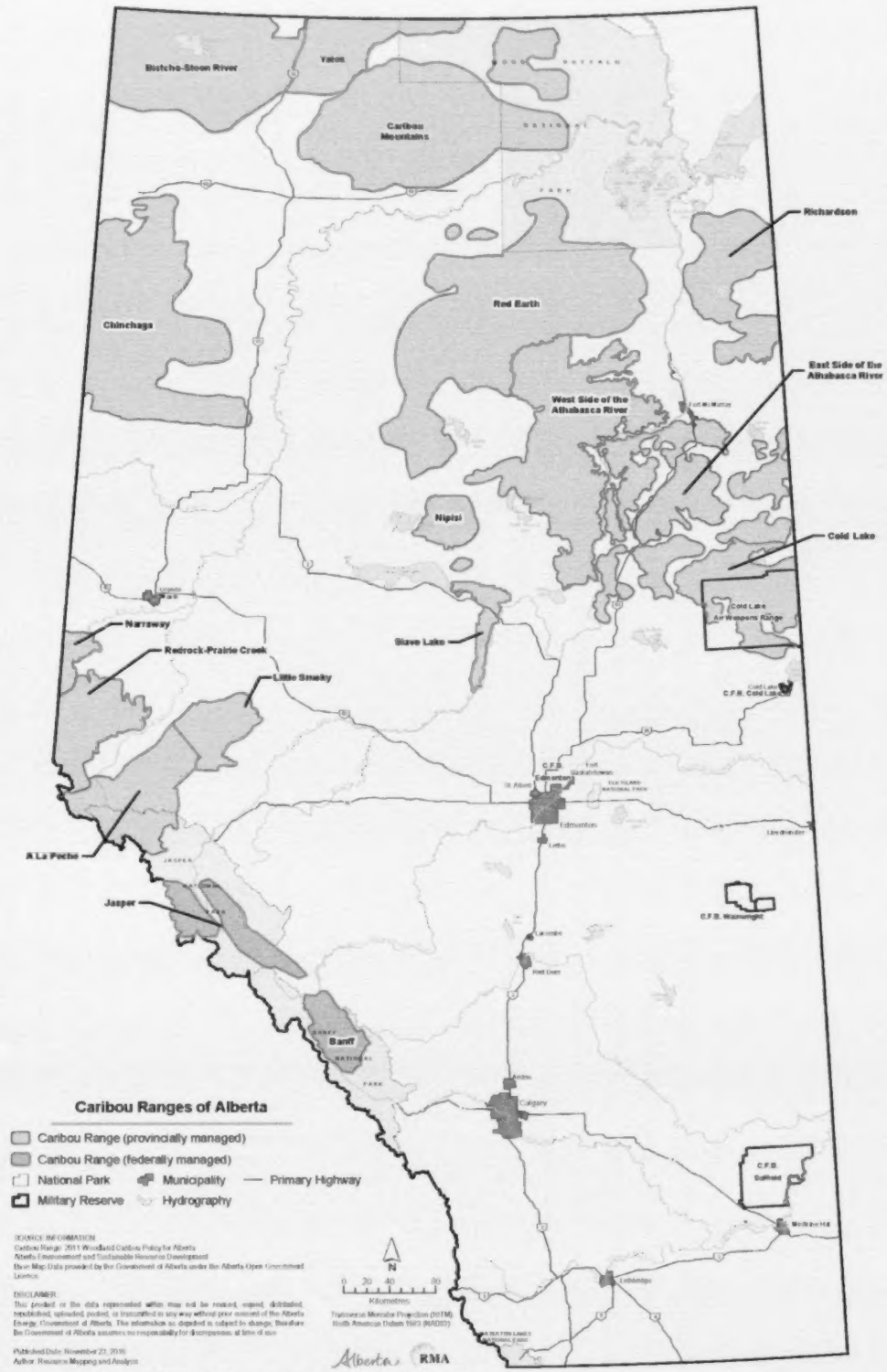


Figure 18. A map showing the caribou ranges within Alberta.

About Alberta's regulatory system

The Crown owns 81 per cent of the mineral rights in Alberta. The other 19 per cent are Freehold mineral rights and are owned by individuals, companies or the federal government on behalf of First Nations. The Coal and Mineral Development Branch is responsible the administration of the Crown's mineral rights for metallic and industrial minerals and coal.

The mineral rights for coal, and metallic and industrial minerals are managed using a variety of agreements, depending on the specific substance and/or activity a client wishes to pursue. Each agreement type is defined and governed through the Alberta's *Mines and Minerals Act*, and the Metallic and Industrial Minerals Tenure Regulation. Fees and rentals are set out in the Mines and Minerals Administration Regulation.

www.energy.alberta.ca

Alberta